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AFM Imaging of Counterion-Induced Phase Transition of Biological Polyelectrolyte Network on a Photopolymer Containing Azo-Dye[1]
TAIJI IKAWA, OSAMU WATANABE, Toyota CRDL, Inc., Japan, YOULI LI, CYRUS SAFINYA, UC, Santa Barbara — We present a new method for direct imaging of protein assembly based on atomic force microscopy and a protein immobilization technique using a nonionic photopolymer containing azo-dye; the photopolymer was found to be capable of holding proteins in an aqueous solution by exposure to blue-wavelength light. As a model system, we examine the association of actin filament in the presence of divalentcation. We find the method clearly represents phase transitions of the filament network as a function of both cation concentration and filament length. Longer filaments (up to 10 μm) shows an isolated single filament phase (0 mM of Mg^{2+}) transforms to a web-like network phase (5-10 mM) and finally condenses into a close-packed bundled phase (20-80 mM). Meanwhile, shorter filaments (up to 200 nm) form a co-existing nematic-like raft phase at intermediate cation concentration (5-40 mM), coinciding with the previous result obtained by small-angle x-ray scattering study. From angular analysis, the longer filament is shown to prefer wider angular configuration, suggesting the interaction between filaments is dependent on their length such that longer filaments are more repulsive than shorter one.

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